Thinking with perceptual symbols then involves the brain initiating sequences of operations that correspond to what it would undergo if confronted with actual input from visual objects behaving in a particular manner. Barsalou refers to this as *simulation*. Moreover, simulation is not restricted to repeating those sequences of neural processes that occurred in previous experience. Just as we can imagine objects that we have never seen by recombining components of things we have seen, we can imagine sequences of changes that depart from those that we have actually encountered.

Although humans are relatively good at forming and manipulating images of rather simple systems, if what we are imagining is the working of a rather complex mechanism that has multiple components interacting with and changing each other, we often go astray. We fail to keep track of all the changes that would occur in other components of the system in response to the changes we do imagine. Thus, the usefulness of mental animation for understanding a mechanism does reach a limit. Ordinary people may simply stop trying at this point, but scientists and engineers often find it important to do better and hence have created tools that supplement human abilities to imagine a system in action. One tool involves building a scale model (or otherwise simplified version) of a system and using it to determine how the actual system would behave. The behavior of the scale model *simulates* that of the actual system. For example, the behavior of objects in wind tunnels can be used to simulate phenomena involving turbulence in natural environments. If instead an investigator can devise equations that accurately characterize the changes in a system over time, the investigator can often determine how the system will behave by solving the equations without actually building a scale model. In this case the simulation is done with a mathematical model rather than a physical model. The advent of the computer provided both a means of solving the equations of a mathematical model and an additional means of simulating systems. Higher level computer languages are designed to represent complex structures and their interactions, and by using these resources, one can often create a computer simulation of the interactions in a complex system (Jonker, Treur, & Wijngaards, 2002).

These different modes of simulating a system all provide an important advantage when a mechanism is complex with multiple operations occurring simultaneously – they do not lose track of some of the interactions as a human imagining the operation of the mechanism often does. But even when it is a human who is doing the imagining, what he or she is doing can also be characterized as simulating the mechanism.

Although a mechanism can be represented by means of a diagram, it can also be described linguistically. Is there any fundamental difference between